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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/560,822	04/05/2006	Gerard Olivier	281470US2XPCT	8916

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EXAMINER	
KWON, ASHLEY M	

ART UNIT	PAPER NUMBER
4111	

NOTIFICATION DATE	DELIVERY MODE
02/19/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/560,822	OLIVIER ET AL.	
	Examiner	Art Unit	
	ASHLEY KWON	4111	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *10-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3/10/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

The spacing of the lines of the specification is such as to make reading difficult. New application papers with lines 1½ or double spaced on good quality paper are required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

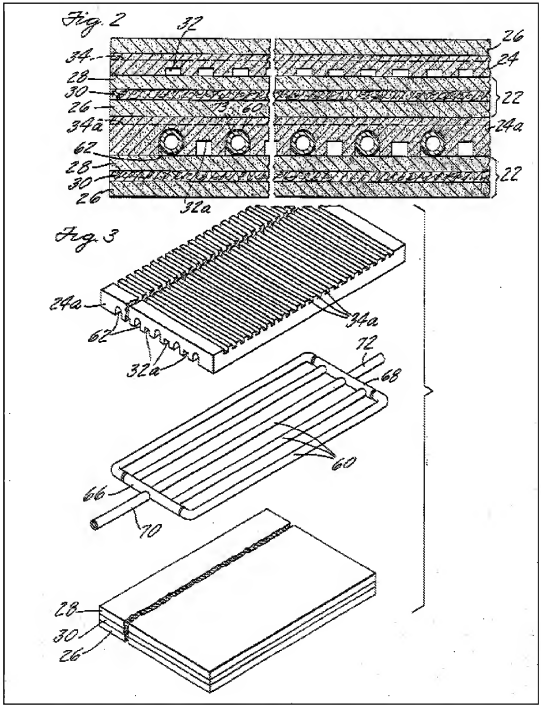
The factual inquiries set forth in *Graham* **v.** *John Deere Co.,* 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 10-12 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reiser (US Pat. No. 3,964,930) in view of Fujita et al. (JP 2002-238272 A) (hereinafter "Fujita").

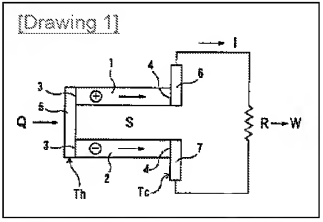
Regarding claim 10, Reiser teaches a fuel-cell stack (10, 12) comprising: at least two elementary cells (22; see col. 3 line 59)) disposed in a facing relationship, for an

exothermic combustion reaction constituting a heat source; and an internal duct (cooler tubes, 60) formed between the cells for circulation of a cooling fluid constituting a cold sink (see figs. 2 and 3; see col. 2, line 19-23; see col. 4, line 57-78).

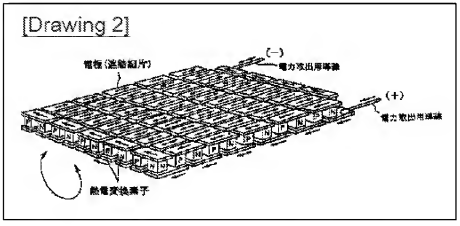


Reiser fails to teach a plurality of thermoelectric modules, each comprising a pair of elements of two conductive materials of dissimilar nature, a first end of each pair being in thermal contact with the heat source or the cold sink, a second end of each of the elements of the pair being in contact with the other source or sink, and being electrically connected to a neighboring module. However, Fujita teaches a plurality of thermoelectric modules (p-n unit), each comprising a pair of elements of two conductive materials of dissimilar nature (P-type, 1; N-type, 2; see drawing 1), a first end of each pair being in thermal contact with the heat source or the cold sink, a second end of each of the elements of the pair being in contact with the other source or sink (see paragraph 50; see drawing 9a), and being electrically connected to a neighboring module (see paragraph 27; see drawing 2)

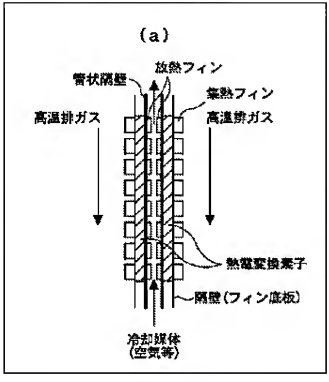
[Drawing 1]



[Drawing 2]



[Drawing 9]



The combination of familiar elements is likely to be obvious when it does no more than yield predictable results. See *KSR International Co. v. Teleflex Inc.*, 550 U.S. __,__, 82 USPQ2d 1385, 1395 – 97 (2007) (see MPEP § 2143, A.). It would have been obvious to a person of ordinary skill in the art to use the thermoelectric element taught by Fujita in drawing 9a in the fuel cell stack taught by Reiser, specifically in the cooler tubes 60, in order to generate electricity (*Fujita:* see paragraph 2).

Regarding claim 11, Reiser in vew of Fujita teaches a fuel-cell stack according to claim 10, wherein the thermoelectric module is composed of a pair of conductive materials (*Fujita:* P and N-type semiconductors, 1 and 2) connected at one of their ends to a conductive connection (*Fujita:* lateral electrode, 5) in thermal contact with a plate of

the heat source (*Reiser:* electrically conductive plate, 24a), and connected to one another at their free ends by a conductive connection (*Fujita:* lateral electrode, 6, 7) in thermal contact with the cold sink (cooler tubes ,60).

Regarding claim 12, Resier in view of Fujita teaches a fuel-cell stack according to claim 10, wherein the two conductive materials of the thermoelectrical modules are semiconductor materials, a first of P type and a second of N type (*Fujita:* see paragraph 27).

Regarding claim 15, Reiser in view of Fujita fails to teach a fuel-cell stack according to claim 10, wherein a last thermoelectric module of an assembly disposed along a first elementary cell is electrically connected in series or in parallel with a first thermoelectrical module of an assembly disposed along a second elementary cell. However, the Supreme Court decided that a claim can be proved obvious merely by showing that the combination of known elements was obvious to try. In this regard, the Supreme Court explained that, "[w]hen there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has a good reason to pursue the known options within his or her technical grasp." An obviousness determination is not the result of a rigid formula disassociated from the consideration of the facts of the case. Indeed, the common sense of those skilled in the art demonstrates why some combinations would have been obvious where others would not. Therefore, choosing from a finite number of identified, predictable solutions, with a reasonable expectation for success, is likely to be obvious to a person if ordinary skill in the art. See *KSR International Co. v. Teleflex*

Inc., 550 U.S. __,__, 82 USPQ2d 1385, 1395 – 97 (2007) (see MPEP § 2143, E.). It is well known in the art that fuel cells may be connected in series or in parallel to increase either the current or the voltage of the fuel cell system. Since the goal of this device is to produce electricity, it would have been obvious to a person of ordinary skill in the art that the thermoelectric modules of different fuel cells be connected in series or in parallel to increase either the current or the voltage of the electricity produced.

Regarding claim 16, Reiser in view of Fujita teaches a fuel-cell stack according to claim 10, wherein a plate forming a wall equipped with fins (radiation fins) is disposed on the external surface of the assembly of thermoelectric modules on the same side as the internal cooling duct (*Fujita:* see paragraph 52, see drawing 9).

Claims 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Reiser in view of Fujita as applied to claims 10-12 and 15-16 above, and further in view of Ghamaty et al. (US Pat. No. 6,096,964) (hereinafter "Ghamaty") .

Regarding claim 13, Reiser in view of Fujita fail to teach a fuel-cell stack according to claim 12, wherein the N-type materials are alloys of silicon and germanium doped with phosphorus and the P-type materials are alloys of silicon and germanium doped with boron.

However, Ghamaty teaches thermoelectric elements, N and P-type samples consisting of silicon and germanium alloys, with the N-type doped with phosphorous and the P-type doped with boron (see col. 4, lines 18-20; col. 4, lines 40-41). Ghamaty teaches that a good thermoelectric material is measured by its "figure of merit", or Z,

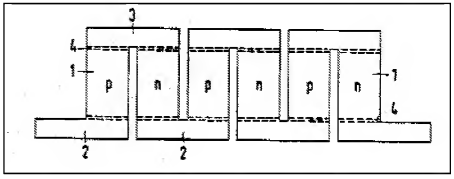
defined as: $Z = S^2 / \rho K$, where S is the Seebeck coefficient, ρ is the electrical resistivity, and K is the thermal conductivity. Good thermoelectric materials have large values of S and low values of ρ and K, which results in a high Z value as well (see col. 1, lines 15-30). A person of ordinary skill in the art would have found it obvious to use N-type materials that are alloys of silicon and germanium doped with phosphorus and P-type materials that are alloys of silicon and germanium doped with boron since silicon germanium alloys are well known to have high Z values, in order to improve the thermoelectric materials (see col. 4, lines 49-50).

Claims 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Reiser in view of Fujita as applied to claims 10-12 and 15-16 above, and further in view of Szabo de Bucs et al. (US Pat No. 3,470,033) (hereinafter "Szabo de Bucs") .

Regarding claim 14, Reiser in view of Fujita fail to teach a fuel-cell stack according to claim 10, wherein the conductive connections connecting the ends of the materials are composed of molybdenum electrodes.

However, Szabo de Bucs teaches a thermoelectric device whose legs are interconnected by contact bridges (2, 3) composed of an alloy of silicon with molybdenum (see col. 4, lines 57-61; see the figure). A person of ordinary skill in the art would have found it obvious to use molybdenum in the conductive connections connecting the ends of the N and P-type materials because the metallic component provided by molybdenum contributes to securing a particularly high mechanical

strength, high resistance to breaking, and high stability with respect to changes in temperature to the contacting bond (*Szabo de Bucs:* see col. 3, lines 18-22).



Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reiser in view of Fujita.

Regarding claim 17, Reiser teaches a fuel cell stack in an interior of which there circulates, between two elementary cells (22) of the fuel-cell stack constituting the heat source, a cooling fluid constituting the cold sink (*Reiser:* see col. 2, lines 19-23).

Reiser fails to teach a method for partial recuperation of thermal energy originating from a fuel-cell stack, where the cooling fluid is placed in thermal contact with a plurality of thermoelectric modules and the electrical energy generated by Seebeck effect is recuperated. However, Fujita teaches a method for partial recuperation of thermal energy originating from a fuel cell stack (*Fujita:* see paragraph 3), where the cooling fluid is placed in thermal contact with a plurality of thermoelectric modules (p-n unit) (*Fujita*: see paragraph 50; see drawing 9) and the electrical energy generated by Seebeck effect is recuperated (see paragraph 3). The combination of familiar elements is likely to be obvious when it does no more than yield predictable

results. See *KSR International Co. v. Teleflex Inc.*, 550 U.S. __,__, 82 USPQ2d 1385, 1395 – 97 (2007) (see MPEP § 2143, A.). It would have been obvious to a person of ordinary skill in the art to use a method for partial recuperation of thermal energy by the thermoelectric element taught by Fujita in drawing 9a, in the fuel cell stack taught by Reiser, specifically in the cooler tubes 60, in order to recuperate electrical energy generated by Seebeck effect (*Fujita:* see paragraph 2).

Regarding claim 18, Reiser in view of Fujita teaches a method according to claim 17, wherein cooling of the cell stack is two-phase (*Reiser:* see col. 6, lines 3-6).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ASHLEY KWON whose telephone number is (571)270-7865. The examiner can normally be reached on Monday to Friday 7:30 - 5pm EST with alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Sines can be reached on (571) 272-1263. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AK

/Brian J. Sines/
Supervisory Patent Examiner, Art Unit 4111